

Chapter 4

PLANNING ACTIVITY LEVELS AND FACILITY REQUIREMENTS

PLANNING ACTIVITY LEVELS

The purpose of preparing long-term forecasts, as presented in Chapter 3, is to assist in the determination of future land and facility requirements to meet the aviation demands of the Airport service region. Increased aviation demand at an air carrier airport results in increased requirements for airfield facilities; passenger terminal facilities; automobile parking for passengers, visitors, and employees; general aviation facilities, including fixed based operations; air cargo facilities; and other aviation- and nonaviation-related development that requires proximity to the Airport.

Over the years, airport master plans and aviation demand forecasts have been used to develop year-based, short-, medium-, and long-range capital improvement plans and programs. Historically, facility requirements have been based on activity forecasts to occur 5, 10, and 20 years into the future, as required by the FAA. Year-based forecasts are necessary for determining short-term (typically 5-year) improvements to be included in capital improvement and financial plans. However, because so many variables can affect the achievement of a forecast for a specific year, the value of such forecasts has become questionable as the primary basis for identifying when improvements might be needed, particularly for long-range airport planning.

Aviation activity at Tucson International Airport has been affected by these variables. For example, the numbers of enplaned passengers and aircraft operations at the Airport varied significantly between 1985 and 1994 (the base year for the forecasts presented in Chapter 3). Although the general trend is that both of these demand components have increased over the long-term and are expected to continue to increase in the future, it is interesting to note that, from 1987 to 1992, the number of enplaned passengers *decreased* from 1.58 million to 1.25 million. This decrease was primarily a result of the national and local recessions and lower airfares offered from Phoenix, which caused some passengers who would otherwise have flown from Tucson International Airport to use Phoenix Sky Harbor International Airport instead.

The number of enplaned passengers at Tucson International Airport increased about 31% between 1992 and 1994, numbering about 1.64 million in 1994. The number of enplaned passengers increased further to about 1.72 million in 1995. The introduction of service by low-fare carriers and strong economic growth have been the major contributors to this increase in the number of passengers enplaned at the Airport. Such fluctuations are difficult to predict years in advance.

Therefore, for this Master Plan Update, the Authority has used a strategic planning approach, in which *planning activity levels* (PALs) are used as a basis for long-range planning and recommended capital improvements, rather than the traditional 20-year look-ahead approach. The potential ultimate development of the Airport is addressed in the Master Plan Update in terms of PALs, and recommendations for the development of land uses and facilities are based on specific demand components that trigger the need for such development, rather than planning for certain conditions (such as the number of enplaned passengers or aircraft operations) to occur in a specific year.

PALs 1 through 4 presented in Table 4-1 were established for the following demand components: (1) enplaned passengers, (2) cargo, (3) airline aircraft departures, (4) based aircraft, and (5) aircraft operations. Although some dependencies exist between certain components, each represents a discrete element of demand that alone or in combination with other demand components triggers the need for facility development, and the timing of achievement of the PALs may be different for each of the demand components. For example, if the number of enplaned *domestic* passengers increases at a rate consistent with the "base" forecasts for the Airport, the numbers of domestic passengers associated with each PAL would be expected to be achieved during the following time frames:

- 1,910,000 (PAL 1): 1996 to 1998
- 2,357,000 (PAL 2): 1999 to 2003
- 2,789,000 (PAL 3): 2004 to 2010
- 3,673,000 (PAL 4): 2011 to 2020

On the other hand, if the number of enplaned *international* passengers increases at a rate consistent with the "low" forecasts, the number of enplaned international passengers associated with each PAL would be expected to be achieved during the following time frames:

- 90,000 (PAL 1): 1998 to 2004
- 143,000 (PAL 2): 2010 to 2020
- 211,000 (PAL 3): beyond 2020
- 327,000 (PAL 4): beyond 2020

Table 4-1
PLANNING ACTIVITY LEVELS
Tucson International Airport

Demand component	1995 (a)	Planning activity levels			
		1	2	3	4
Enplaned passengers					
Domestic	1,676,907	1,910,000	2,357,000	2,789,000	3,673,000
International					
Air carrier	29,416	66,000	100,000	147,000	227,000
Commuter	<u>14,214</u>	<u>24,000</u>	<u>43,000</u>	<u>64,000</u>	<u>100,000</u>
Total international	<u>43,630</u>	<u>90,000</u>	<u>143,000</u>	<u>211,000</u>	<u>327,000</u>
Total enplaned passengers	1,720,537	2,000,000	2,500,000	3,000,000	4,000,000
Cargo (pounds)					
Enplaned cargo					
Freight	23,238,019	24,102,000	33,644,000	40,766,000	54,585,000
Mail	<u>7,285,548</u>	<u>7,743,000</u>	<u>9,249,000</u>	<u>10,645,000</u>	<u>13,519,000</u>
Total enplaned cargo	30,523,567	31,845,000	42,893,000	51,411,000	68,104,000
Deplaned cargo					
Freight	25,937,429	33,632,000	46,571,000	56,294,000	75,200,000
Mail	<u>9,186,480</u>	<u>9,771,000</u>	<u>11,671,000</u>	<u>13,433,000</u>	<u>17,058,000</u>
Total deplaned cargo	35,123,909	43,403,000	58,242,000	69,727,000	92,258,000
Total enplaned and deplaned cargo					
Freight	49,175,448	57,734,000	80,215,000	97,060,000	129,785,000
Mail	<u>16,472,028</u>	<u>17,514,000</u>	<u>20,920,000</u>	<u>24,078,000</u>	<u>30,577,000</u>
Total cargo	65,647,476	75,248,000	101,135,000	121,138,000	160,362,000
Airline aircraft departures					
Passenger aircraft					
Domestic	22,096	26,700	31,100	34,700	43,200
International					
Air carrier	653	1,000	1,500	2,100	3,000
Commuter	<u>3,029</u>	<u>3,500</u>	<u>5,700</u>	<u>7,300</u>	<u>9,300</u>
Total international	<u>3,682</u>	<u>4,500</u>	<u>7,200</u>	<u>9,400</u>	<u>12,300</u>
Total passenger aircraft	25,778	31,200	38,300	44,100	55,500
All-cargo aircraft	<u>1,343</u>	<u>1,500</u>	<u>1,900</u>	<u>2,200</u>	<u>2,800</u>
Total airline aircraft departures	27,121	32,700	40,200	46,300	58,300
Based aircraft	338 (b)	350 (c)	350 (c)	350 (c)	350 (c)
Aircraft operations					
Annual					
Air carrier	46,181	55,700	67,100	75,800	95,000
Air taxi/commuter	16,089	24,400	31,600	36,800	45,400
General aviation	144,702	150,000 (c)	150,000 (c)	150,000 (c)	150,000 (c)
Military	<u>36,336</u>	<u>40,000</u>	<u>40,000</u>	<u>40,000</u>	<u>40,000</u>
Total annual aircraft operations	243,308	270,100	288,700	302,600	330,400
Peak hour	91	98	101	104	116

(a) 1994 was the base year for the aviation demand forecasts presented in Chapter 3, which were prepared in mid-1995. As data for 1995 are now available, they have been used in this chapter.

(b) According to a September 1995 survey conducted by the Authority. Excludes military aircraft based on land adjacent to the Airport at the Arizona Air National Guard site.

(c) The forecast number of based aircraft at Tucson International Airport is based on the number of general aviation operations forecast to occur at the Airport. For the reasons described in Chapter 3, the number of general aviation operations is forecast to remain constant at about 150,000 per year through the planning period. The forecasts of general aviation operations and based aircraft in no way imply that the Tucson Airport Authority intends to restrict general aviation activity at Tucson International Airport.

Sources: 1995—Tucson Airport Authority and Federal Aviation Administration.
 Planning activity levels—Leigh Fisher Associates, March 1996.

FACILITY REQUIREMENTS

The advantage of identifying PALs for individual demand components is that the need to develop specific facilities can be based on the achievement of levels of certain types of activity rather than the achievement of overall traffic levels. Rapid growth in one demand component only triggers the development of those facilities needed to accommodate activity associated with that component. For example, increased cargo demand, such as that caused by the development of a cargo hub, would trigger the development of new cargo facilities—the need for which is based on the total weight of cargo shipped through the airport. If development of the hub results in significant increases in annual aircraft operations, particularly during peak hours, it may also trigger new runway development, the need for which is based on the number of annual and peak-hour aircraft operations at the airport.

The PALs presented in Table 4-1 represent activity levels that could be achieved within the 20-year master planning horizon. However, it is also important to consider potential demand beyond that period to identify and preserve land for the ultimate development of the Airport. For example, the number of total operations, types of aircraft, and number of airline aircraft departures presented in Table 4-1 are all used to determine the number and length of runways required at the Airport through PAL 4. After PAL 4 is achieved, it is likely that additional airfield development will be required. Therefore, the ultimate plan for the Airport will include facilities that may not be needed for 30 or more years. However, acquisition of the land to accommodate these facilities as the land becomes available preserves the Authority's ability to provide the facilities when needed.

Requirements for various Airport facilities to accommodate demand through PAL 4 are discussed in the following sections.

Airfield

Table 4-2 summarizes the airfield requirements through PAL 4 and the associated demand components that trigger the need for airfield development. Annual and peak-hour aircraft operations are the components that trigger the need for runway and associated taxiway development. The numbers of aircraft operations are, in turn, dependent on the number of enplaned passengers, amount of cargo handled at the Airport, and numbers of general aviation and military operations. On the basis of a review of projected capacity and delay statistics and a comparison of projected operations with the estimated annual service volume (ASV) for the Airport, an **additional air carrier runway parallel to Runway 11L-29R will need to be in place by the time the number of annual aircraft operations reaches that associated with PAL 3.**

Table 4-2
**PLANNING ACTIVITY LEVELS
 AND RESULTING AIRFIELD REQUIREMENTS**
 Tucson International Airport

Demand component	1995 (a)	Planning activity levels			
		1	2	3	4
Enplaned passengers	1,720,537	2,000,000	2,500,000	3,000,000	4,000,000
Cargo (pounds)	65,647,476	75,249,000	101,135,000	121,138,000	160,363,000
Airline aircraft departures	27,121	32,700	40,200	46,300	58,300
Aircraft operations					
Annual					
Air carrier	46,181	55,700	67,100	75,800	95,000
Air taxi/commuter	16,089	24,400	31,600	36,800	45,400
General aviation (a)	144,702	150,000	150,000	150,000	150,000
Military	<u>36,336</u>	<u>40,000</u>	<u>40,000</u>	<u>40,000</u>	<u>40,000</u>
Total annual aircraft operations	243,308	270,100	288,700	302,600	330,400
Peak hour	91	98	101	104	116
Annual Delay	0.47 min/OPS 1905 hrs annual (Leigh Fisher 11/14/96)				
		Requirements for planning activity levels			
Airfield	1995 (b)	1	2	3	4
Air carrier runways (11-29)					
Number	1	1	1	2 (c)	2 (c)
Length (feet)	10,994	11,000	11,000	11,000	11,000
General aviation runways (11-29)					
Number	2 (d)	2 (d)	2 (d)	2 (c)	2 (c)
Length (feet)	9,118	9,118	11,000	11,000	11,000
Crosswind runways (3-21)					
Number	1	1	1	1	1
Length (feet)	7,000	7,000	7,000	7,000	7,000

- (a) For the reasons described in Chapter 3, the number of general aviation operations is forecast to remain constant at about 150,000 per year through the planning period. The forecast of general aviation operations in no way implies that the Tucson Airport Authority intends to restrict general aviation activity at Tucson International Airport.
- (b) 1994 was the base year for the aviation demand forecasts presented in Chapter 3, which were prepared in mid-1995. As data for 1995 are now available, they have been used in this chapter.
- (c) The second air carrier runway would also accommodate general aviation aircraft operations. The existing general aviation runway would be converted back to a taxiway. The requirement is for a total of two parallel runways (11-29) each accommodating both air carrier and general aviation operations.
- (d) Includes the air carrier runway and an existing taxiway used as a general aviation runway.

Sources: 1995—Tucson Airport Authority and Federal Aviation Administration.
 Planning activity levels—Leigh Fisher Associates, March 1996.

ASV is a measure of the number of operations that can occur at an airport without significant delay. The ASV is a function of the number and layout of the runways, weather conditions over the year, the types of aircraft operating at the airport, and the numbers of aircraft operations occurring during the peak hours of the day. ASV has been used as a planning guide for determining the need and timing for additional runways. Generally, when a level of activity (e.g., aircraft operations) reaches 60% of the capacity of the facilities that accommodate the activity (e.g., runways), planning for new facilities should begin. Then, when the level of activity reaches 80% of capacity, the new facilities should be constructed. The ASV for Tucson International Airport has been estimated to range from about 330,000 to 380,000* operations for the current runway configuration and aircraft fleet mix. In 1994, 251,574 aircraft operations (about 66% to 76% of the ASV) were accommodated at the Airport, and in 1995, 243,308 aircraft operations (about 64% to 74% of the ASV) were accommodated at the Airport. The number of annual aircraft operations associated with PAL 2 is 288,700 (about 76% to 87% of the ASV). These data indicate that planning for an additional air carrier runway should begin in the very near future so that construction of the runway can begin about the time the number of annual aircraft operations reaches the level associated with PAL 2 and be completed before the number of aircraft operations reaches the level associated with PAL 3.

A runway capacity and annual aircraft delay analysis was conducted to determine whether it would be beneficial for the centerline-to-centerline spacing between existing Runway 11L-29R and the new parallel runway to be sufficient to accommodate simultaneous aircraft landings in all weather conditions.** On the basis of anticipated future numbers of annual operations and aircraft schedules, it was concluded that it is not necessary to provide for simultaneous landings in poor weather conditions, particularly considering that these conditions occur less than 1%*** of the time in Tucson.

Required runway length was also analyzed as part of the Master Plan Update. The required runway length is dependent on both aircraft and airport characteristics.

*Source of ASV of 330,000: Leigh Fisher Associates, based on the FAA's Annual Delay Model. Source of ASV of 380,000: Pima Association of Governments, *Regional Aviation System Plan, Summary Report*, February 1995. The two estimates of ASV were prepared using different assumptions regarding the future fleet mix at the Airport. The assumptions used by Leigh Fisher Associates are consistent with the forecast that the number of general aviation operations would remain constant. The assumptions used for the *Regional Aviation System Plan* apparently were for a higher percentage of general aviation aircraft in the fleet mix, which would lead to a higher ASV for the current runway configuration.

**The minimum distance between parallel runways for simultaneous aircraft landings in poor weather conditions is 4,300 feet considering (1) current FAA standards and (2) existing FAA radar equipment at the Airport.

***Analyzed from data obtained from U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Climatic Data Center.

The type of aircraft and the nonstop distance to be traveled by a departing aircraft are the primary aircraft characteristics that determine required runway length.* The aircraft elevation above sea level, orientation and gradient of runways, terrain surrounding the airport, and temperature conditions over the year are the primary airport characteristics that determine the required runway length. On the basis of (1) the characteristics of Tucson International Airport, (2) the types of aircraft that currently serve and are anticipated to serve the Airport in the future, and (3) the markets currently served and anticipated to be served nonstop from the Airport, it was determined that a runway length of 11,000 feet is sufficient for existing and future runways to accommodate air carrier aircraft anticipated to serve the Airport.

Representatives of the passenger and all-cargo airlines serving the Airport completed a questionnaire to determine existing and future needs. All but one of the airlines that responded stated that the existing Runway 11L-29R length of 10,994 feet is sufficient for their existing and future needs. One all-cargo airline stated that a runway length of about 11,300 feet would be required for departures of one of the aircraft types that it operates, under certain temperature conditions and a full payload. However, the airline's operations are not significantly limited by the 11,000-foot runway. It was decided that, at this time, it was not necessary to consider constructing a runway longer than 11,000 feet. **It is recommended that, as part of specific planning and design of the new parallel runway, the required runway length again be reviewed to determine if providing additional length would be prudent.**

The requirements for the crosswind runway were also reviewed. Crosswind Runway 3-21 is used (1) for convenience by general aviation aircraft when wind conditions allow and (2) by all aircraft when there are strong winds from the southwest that prevent the use of the primary runways. Historical wind data show that conditions would require the lighter general aviation aircraft to use the crosswind runway less than 5% of the time and the heavier air carrier aircraft to use the crosswind runway less than 2% of the time. The length of the existing crosswind runway is adequate for general aviation aircraft. The length of the crosswind runway was not identified by the airlines or the Arizona Air National Guard as a significant problem for their operations, although it is about 4,000 feet shorter than Runway 11L-29R. Problems that do occur when the runway is in use relate to airspace conflicts with operations at Davis-Monthan Air Force Base and with runway exits and aircraft taxiing to and from the runway. Because of the infrequent use of the crosswind runway by air carrier aircraft and airspace interactions with aircraft operating at Davis-Monthan Air Force Base, neither a second crosswind runway nor an extension of existing Runway 3-21 is required over the planning period.

*The distance an aircraft is to travel after departing from an airport determines the amount of fuel that must be carried on board the aircraft and the resulting takeoff weight of the aircraft. Takeoff weight is a critical factor in determining the runway length required for aircraft departures.

Ultimate development of the Airport (beyond PAL 4) could include the construction of a third parallel runway, although the third parallel runway is not required within the planning period. The need for and timing of the third parallel runway should be addressed in future updates of the master plan. Previous master plans for the Airport have included a fourth parallel runway to accommodate general aviation aircraft as part of the ultimate airfield requirements. The recommendation for this fourth runway was consistent with a recommendation to preserve land east-southeast of the passenger terminal complex and south of Los Reales Road for future general aviation uses. Further review of this recommendation showed that three parallel air carrier runways would be sufficient to accommodate aircraft operations well beyond the planning period. The need for and timing of a third parallel runway should also be addressed in future updates of the master plan.

Passenger Terminal Complex

Table 4-3 summarizes the terminal complex requirements and the associated demand components that trigger the need for passenger terminal development. As shown, the two components that most affect passenger terminal requirements are enplaned passengers (domestic and international passengers are considered separately) and passenger aircraft departures.

As part of passenger terminal complex planning, requirements for specific components, such as ticketing, baggage claim, and curbside, would be established.

Aircraft Gates and Parking Positions. The relationship between the numbers of air carrier aircraft gates and passenger aircraft departures is based on current gate utilization (number of flights served per day at each gate) and anticipated trends in gate utilization. In 1995, an average of about 2.8 passenger airline aircraft departures were accommodated from each operational air carrier aircraft gate each day. It is anticipated that, as the numbers of enplaned passengers and passenger aircraft departures increase, gate utilization will also increase. As demand increases, airlines already serving the Airport would be expected to increase their numbers of flights and could do so, to some extent, with the gates they currently use. Also, gate utilization for the low-fare carriers now serving the Airport tends to be higher than for other airlines. The anticipated gate utilization and resulting gate requirements at the Airport are comparable with those at airports serving similar markets and traffic levels.

As shown in Table 4-3, the number of air carrier aircraft gates needed to accommodate demand is anticipated to increase from the existing 22 to between 34 and 39 when PAL 4 is achieved. The ranges in the number of gates required reflect different assumptions regarding the percentage of daily flights occurring during the peak hour, average occupancy time of gates during the peak hour, overnight aircraft parking patterns, and sharing/nonsharing gate policies. The need for a higher number of gates would typically result from circumstances such as (1) a higher

Table 4-3
**PLANNING ACTIVITY LEVELS
 AND RESULTING TERMINAL COMPLEX REQUIREMENTS**
 Tucson International Airport

Demand component	1995 (a)	Planning activity levels			
		1	2	3	4
Enplaned passengers					
Domestic	1,676,907	1,910,000	2,357,000	2,789,000	3,673,000
International					
Air carrier	29,416	66,000	100,000	147,000	227,000
Commuter	14,214	24,000	43,000	64,000	100,000
Total international	43,630	90,000	143,000	211,000	327,000
Total enplaned passengers	1,720,537	2,000,000	2,500,000	3,000,000	4,000,000
Passenger aircraft departures					
Domestic	22,096	26,700	31,100	34,700	43,200
International					
Air carrier	653	1,000	1,500	2,100	3,000
Commuter	3,029	3,500	5,700	7,300	9,300
Total international	3,682	4,500	7,200	9,400	12,300
Total passenger aircraft departures	25,778	31,200	38,300	44,100	55,500
Requirements for planning activity levels					
Passenger terminal complex	1995 (a)	1	2	3	4
Aircraft gates and parking positions					
Air carrier aircraft gates					
Widebody aircraft (up to DC-10) (b)	5	5	5	5	5
Narrowbody aircraft (up to B-757) (c)	17	20-25	22-27	24-29	29-34
Total	22	25-30	27-32	29-34	34-39
Commuter aircraft parking positions (d)	3	5	6	7	8
Terminal building and concourse area (sq ft) (c) (e)	320,000	500,000 - 600,000	540,000 - 640,000	580,000 - 680,000	680,000 - 780,000
Public automobile parking spaces					
Short-term	576	750	940	1,310	2,000
Long-term (f)	4,018	4,250	5,310	6,190	8,000
Employee parking spaces	510	620	750	870	1,080

- (a) 1994 was the base year for the aviation demand forecasts presented in Chapter 3, which were prepared in mid-1995. As data for 1995 are now available, they have been used in this chapter.
- (b) The existing widebody gates accommodate aircraft up to and including DC-10s. Future requirements are to accommodate aircraft up through MD-11s.
- (c) Ranges reflect different assumptions about the percentage of daily flights occurring in the peak hour, average occupancy times of gates during the peak hour, overnight parking patterns, and sharing/nonsharing gate policies.
- (d) Commuter aircraft can be accommodated in separate parking positions or at air carrier aircraft gates. Three or four commuter aircraft can typically be accommodated on the apron associated with one air carrier aircraft gate.
- (e) The ranges in required terminal area represent ideal allocations of space among various uses. Actual area provided may vary depending on whether additional space is gained by expanding the existing facility or constructing a new terminal.
- (f) Long-term parking includes the lot at the passenger terminal and remote lots served by free shuttle vans.

Sources: 1995—Tucson Airport Authority.

Planning activity levels—Leigh Fisher Associates, March 1996.

percentage of daily operations during the peak hour, (2) longer gate occupancy times, and (3) a higher percentage of gates being used exclusively by one airline. As indicated in the forecasts presented in Chapter 3, it is not anticipated that widebody aircraft will account for a significant share of the fleet mix in the future. However, to maintain the flexibility to accommodate widebody aircraft, it is recommended that five widebody aircraft gates be maintained through the planning period.

The number of commuter aircraft parking positions is based on the number of commuter aircraft departures and the existing and anticipated use of those parking positions. Similar to air carrier aircraft gates, it is assumed that the daily use of commuter aircraft parking positions will increase with demand. Typically, three or four commuter aircraft can be accommodated on the apron associated with an air carrier aircraft gate. Therefore, the need for commuter aircraft parking positions overlaps somewhat with the need for air carrier aircraft gates. To maximize the flexibility of aircraft gate use, particularly of future gates serving international aircraft operations, it is recommended that allowances be made to accommodate commuter aircraft at air carrier aircraft gates.

The application of PALs by demand component can be explained using air carrier aircraft gates and commuter aircraft parking positions as an example. Suppose that the numbers of domestic and international air carrier aircraft departures were consistent with PAL 3 and that the number of commuter aircraft departures was consistent with PAL 1. In this case, 29 to 34 air carrier aircraft gates would be required, but only 5 commuter aircraft parking positions would be required. This example illustrates the importance of understanding the relationships between demand and requirements for each type of Airport facility.

Terminal Area. The passenger terminal area requirements are based on the required number of air carrier aircraft gates and the number of enplaned passengers. The requirements presented in Table 4-3 represent the ideal allocation of space among various uses. Actual areas may vary depending on the method used to achieve the additional space, i.e., either by expanding the existing facility or constructing additional terminal buildings. Since completion of the 1987 Master Plan, changes in the airline industry and in technology—particularly the introduction of electronic ticketing, the more frequent use of airline gates, and increasing emphasis on airport concessions—have changed airport terminal space allocation requirements. Terminal space has been reallocated from ticketing areas to concourse and gate areas because of these trends. Development of new facilities allows for the most efficient allocation of space within the terminal for ticketing, baggage claim, waiting areas, etc., consistent with these changes. Authority decisions regarding future concepts for Airport concessions, including food and beverage facilities, may also affect square footage requirements within the terminal buildings.

Terminal building and concourse area requirements are shown in Table 4-3 to increase from the existing 320,000 square feet to a potential high of about 780,000 square feet when the numbers of enplaned passengers and airline aircraft departures associated with PAL 4 are achieved. **As part of subsequent passenger terminal complex planning, specific space allocations should be identified to respond to existing and future needs.**

Public and Employee Parking. Public parking space requirements are based primarily on the number of enplaned passengers at the Airport. Authority policies and current provisions for parking, comparisons with requirements at airports serving similar traffic levels and passengers with similar travel characteristics, and general guidelines regarding parking requirements were used to establish the recommended numbers of parking spaces and allocations between short- and long-term parking. As shown in Table 4-3, it is anticipated that 10,000 public parking spaces (2,000 short-term and 8,000 long-term) will be required when PAL 4 is achieved. Employee parking requirements are based both on the number of enplaned passengers and the resulting number of airline aircraft departures. Demand for employee parking is expected to reach about 1,080 spaces when PAL 4 is achieved.

Cargo, General Aviation, and Airport Maintenance

Table 4-4 summarizes cargo, general aviation, and maintenance requirements, expressed in acres. Cargo area requirements are based on the amount of cargo handled through the Airport, including belly-freight carried on passenger aircraft, and on the number of all-cargo aircraft departures. As shown, air cargo area requirements increase from the existing 15 acres to about 30 acres when PAL 4 is achieved.

General aviation area requirements are based on the numbers of general aviation operations and based aircraft at the Airport, and include tiedown and hangar space as well as area for services that are required for general aviation aircraft, such as fixed base operations, sales, maintenance, and avionics. The existing general aviation facilities at the Airport occupy about 87 acres, excluding the area occupied by Learjet, which is a specialized general aviation aircraft facility. Because the number of corporate and general aviation aircraft operations and the number of based aircraft at the Airport are not anticipated to change significantly through PAL 4, about 90 acres would be required throughout the planning horizon, given that the available space is efficiently utilized. **It should be noted that the requirements for the general aviation area in no way reflect a desire on the part of the Tucson Airport Authority to limit general aviation activity at Tucson International Airport.** In the event that general aviation activity and the number of based aircraft increase at the Airport, the Authority will develop land accordingly.

Table 4-4
**PLANNING ACTIVITY LEVELS
 AND RESULTING CARGO, GENERAL AVIATION, AND AIRPORT MAINTENANCE
 REQUIREMENTS**
 Tucson International Airport

Demand component	1995 (a)	Planning activity levels			
		1	2	3	4
Cargo (pounds)					
Enplaned					
Freight	23,238,019	24,102,000	33,644,000	40,766,000	54,585,000
Mail	<u>7,285,548</u>	<u>7,743,000</u>	<u>9,249,000</u>	<u>10,645,000</u>	<u>13,519,000</u>
Total enplaned cargo	30,523,567	31,845,000	42,893,000	51,411,000	68,104,000
Deplaned					
Freight	25,937,429	33,632,000	46,571,000	56,294,000	75,200,000
Mail	<u>9,186,480</u>	<u>9,771,000</u>	<u>11,671,000</u>	<u>13,433,000</u>	<u>17,058,000</u>
Total deplaned cargo	35,123,909	43,403,000	58,242,000	69,727,000	92,258,000
Total enplaned and deplaned cargo					
Freight	49,175,448	57,734,000	80,215,000	97,060,000	129,785,000
Mail	<u>16,472,028</u>	<u>17,514,000</u>	<u>20,920,000</u>	<u>24,078,000</u>	<u>30,577,000</u>
Total cargo	65,647,476	75,248,000	101,135,000	121,138,000	160,362,000
All-cargo aircraft departures	1,343	1,500	1,900	2,200	2,800
General aviation aircraft operations	144,702	150,000	150,000	150,000	150,000
Based aircraft	338 (b)	350 (c)	350 (c)	350 (c)	350 (c)
Cargo, general aviation, and maintenance areas		Requirements for planning activity levels			
	1995	1	2	3	4
Air cargo area (acres)	15	15	20	25	30
General aviation area (acres) (d)	87 (b)	90 (c)	90 (c)	90 (c)	90 (c)
Airport maintenance (acres) (e)	4 (f)	10 (g)	10	10	10

(a) 1994 was the base year for the aviation demand forecasts presented in Chapter 3, which were prepared in mid-1995. As data for 1995 are now available, they have been used in this chapter.

(b) According to a September 1995 survey conducted by the Authority. Excludes military aircraft based on land adjacent to the Airport at the Arizona Air National Guard site.

(c) The forecast number of based aircraft at Tucson International Airport is based on the number of general aviation operations forecast to occur at the Airport. For the reasons described in Chapter 3, the number of general aviation operations is forecast to remain constant at about 150,000 per year through the planning period. The forecast of general aviation operations and based aircraft in no way implies that the Tucson Airport Authority intends to restrict general aviation activity at Tucson International Airport.

(d) Excludes the Learjet area, which is a specialized general aviation facility.

(e) Requirements were derived from discussions with Tucson Airport Authority maintenance staff.

(f) This acreage does not include remote storage facilities located at various sites around the Airport.

(g) The required area is based on the assumption that all maintenance storage facilities would be consolidated in the main maintenance facility.

Sources: 1995—Tucson Airport Authority and Federal Aviation Administration.
 Planning activity levels—Leigh Fisher Associates, March 1996.

Airport maintenance facilities are operated by the Tucson Airport Authority and provide for maintenance of Airport facilities, such as the airfield, passenger terminal building, ground access facilities, and landscaping. The requirements included in Table 4-4 refer only to land area, including parking for maintenance staff and warehouse facilities consolidated in one location, and not to specific physical facilities required. It is anticipated that the maintenance facilities will be relocated. As part of the maintenance relocation plan, the specific building area and other requirements should be identified. The location must provide access to the airfield and other Airport areas that would not require the crossing of major roadways to accommodate the movement of machinery used in those areas to and from the maintenance facility.